ENSO Update, the 2011-2012 Winter Outlook and What's an MJO?

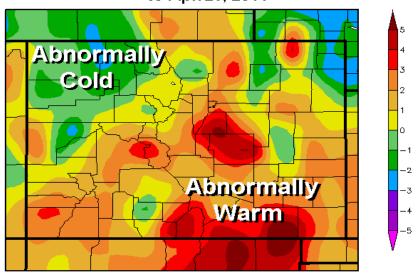
Mike Baker National Weather Service Boulder, Colorado October 23, 2011







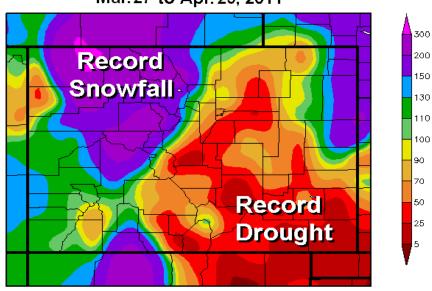
Departure from Normal Temperature (°F) for Colorado Mar. 27 to Apr. 25, 2011



Generated 4/28/2011 at HPRCC using provisional data.

Regional Climate Centers

Percent of Normal Precipitation (%) for Colorado Mar. 27 to Apr. 25, 2011





La Niña Conditions in the Tropical Pacific Ocean **Enhanced Convection** Suppressed Convection 60000 FT 60000 FT Sea Level South Southeast Warmer than Norma America Asia Pacific Pacific **Temperature Anomalies** Colder than Cross Section along the Equator Avg. Warmer than Baker NWS Boulder Average Average

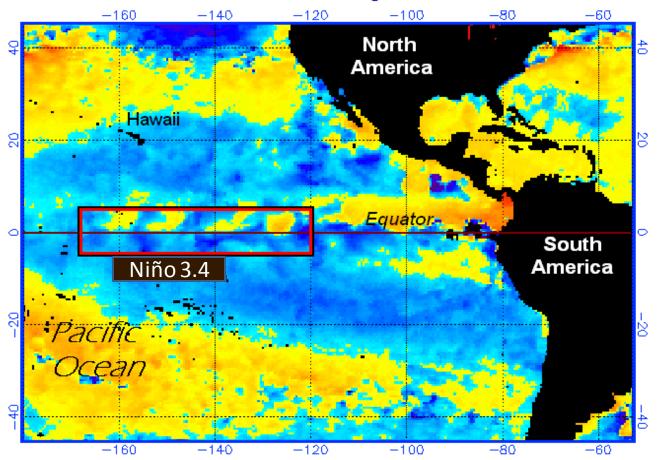
La Niña Advisory Now in Effect

La Niña conditions have returned to the Pacific and are expected to gradually strengthen and continue through the North American winter of 2011-2012.

Atmospheric circulations over the tropical Pacific Ocean exhibited La Niña characteristics during September and October. During this period, anomalous low-level easterly and upper level westerly winds and easterly subsurface ocean currents have persisted along the Equator in the Pacific Ocean. However, these circulation variables remain weaker and less extensive than those observed at the same time last year.

Collectively, these oceanic and atmospheric circulations reflect the return of La Niña conditions.

NOAA/NESDIS SST ANOMALY (degrees C), October 20, 2011



Niño 3.4 - The principal region in the eastern tropical Pacific Ocean used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting El Nino/Southern Oscillation (ENSO).

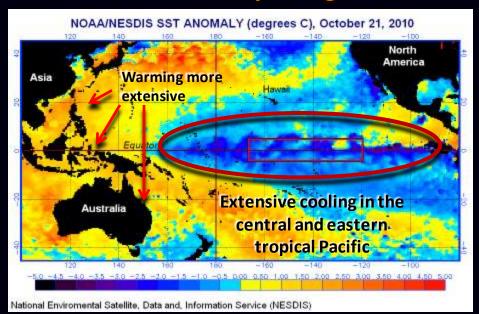
-5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00

Negative sea surface temperature anomalies (SSTAs) continue to cool, although at a slower rate in recent days, along the Equator in the region of the central and eastern Pacific Ocean known as Nino 3.4.

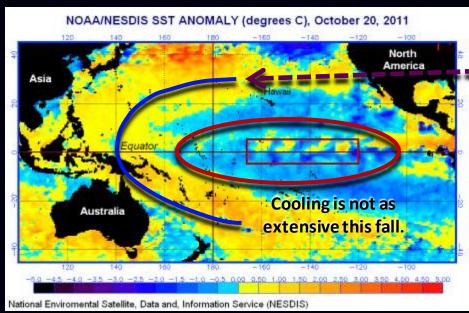


How do current SSTAs compare to departures from normal in the same region a year ago at the beginning of a moderate to strong La Niña?

Comparing October 2010 to October 2011

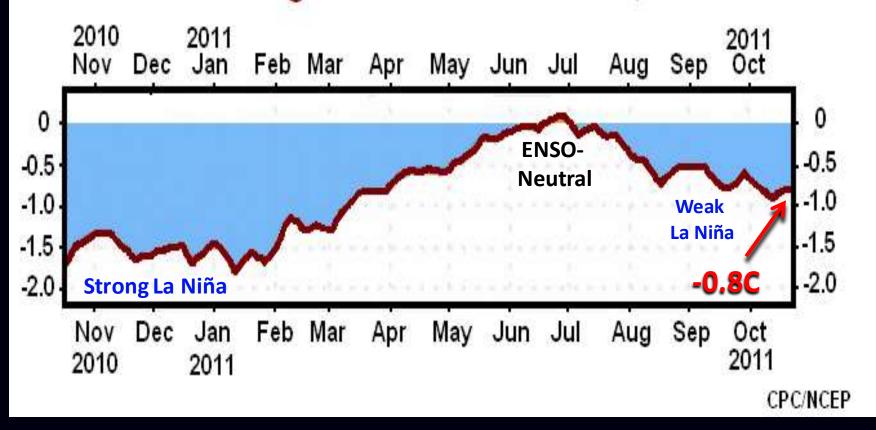


The extent of anomalous cooling in the tropical Pacific Ocean was significantly greater during the fall of 2010 compared to that observed this fall. SSTAs across the central and eastern tropical Pacific in October of 2010 were 2 to 4 degrees C colder than those observed within the same region this fall.

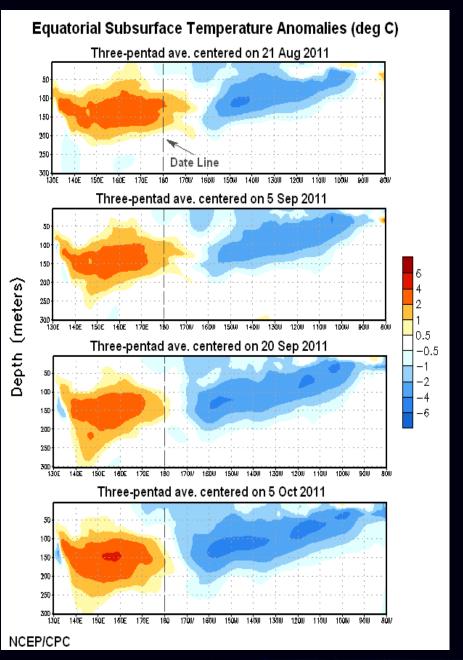


A horseshoe shape pattern of above average SSTAs stretching across the western Pacific Ocean in 2010 and 2011 was far more extensive and warmer during the fall of 2010; another indication that the 2010 La Niña was considerably stronger than the current cold phase ENSO event at this early stage of development.

Sea Surface Temperature Anomaly (SSTA) for Pacific Region Nino 3.4 for October 17, 2011



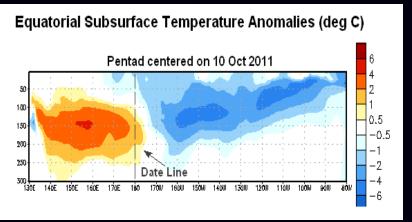
The latest weekly SSTA for Niño 3.4 is -0.8C.



Since mid-August 2011, negative subsurface (100-300 meters deep) temperature anomalies in the east central Pacific have continued to cool as they expand westward towards the International Date Line and eastward to the northwest coast of South America.

However, in the recent period, negative subsurface anomalies remain nearly unchanged.





Year	DJF	JFM	FMA	МАМ	АМЈ	МЈЈ	JJA	JAS	ASO	SON	OND	NDJ
I Cai	DJF	JEM	ГМА	MAM	AMJ	MJJ	JJA	JAS	ASU	SUN	OND	נטא
2000	-1.6	-1.4	-1.0	-0.8	-0.6	-0.5	-0.4	-0.4	-0.4	-0.5	-0.6	-0.7
2001	-0.6	-0.5	-0.4	-0.2	-0.1	0.1	0.2	0.2	0.1	0	-0.1	-0.1
2002	-0.1	0.1	0.2	0.4	0.7	0.8	0.9	1.0	1.1	1.3	1.5	1.4
2003	1.2	0.9	0.5	0.1	-0.1	0.1	0.4	0.5	0.6	0.5	0.6	0.4
2004	0.4	0.3	0.2	0.2	0.3	0.5	0.7	0.8	0.9	0.8	0.8	0.8
2005	0.7	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.2	-0.1	-0.4	-0.7
2006	-0.7	-0.6	-0.4	-0.1	0.1	0.2	0.3	0.5	0.6	0.9	1.1	1.1
2007	0.8	0.4	0.1	-0.1	-0.1	-0.1	-0.1	-0.4	-0.7	-1.0	-1.1	-1.3
2008	-1.4	-1.4	-1.1	-0.8	-0.6	-0.4	-0.1	0	0	0	-0.3	-0.6
2009	-0.8	-0.7	-0.5	-0.1	0.2	0.6	0.7	0.8	0.9	1.2	1.5	1.8
2010	1.7	1.5	1.2	0.8	0.3	-0.2	-0.6	-1.0	-1.3	-1.4	-1.4	-1.4
2011	-1.3	-1.2	-0.9		-0.2	0.2	0	-0.2	1.5			217

El Niños (warm phase events): ONI of +0.5 and higher (red numbers)

La Niñas (cold phase events): ONI of -0.5 and lower (blue numbers)

ENSO-Neutral (near average conditions):
ONI below 0.5 and above -0.5 (black numbers)

An ONI of -0.2 indicates ENSO-neutral conditions during the three-month climate season of July-August-September of 2011.

Oceanic Niño Index - ONI

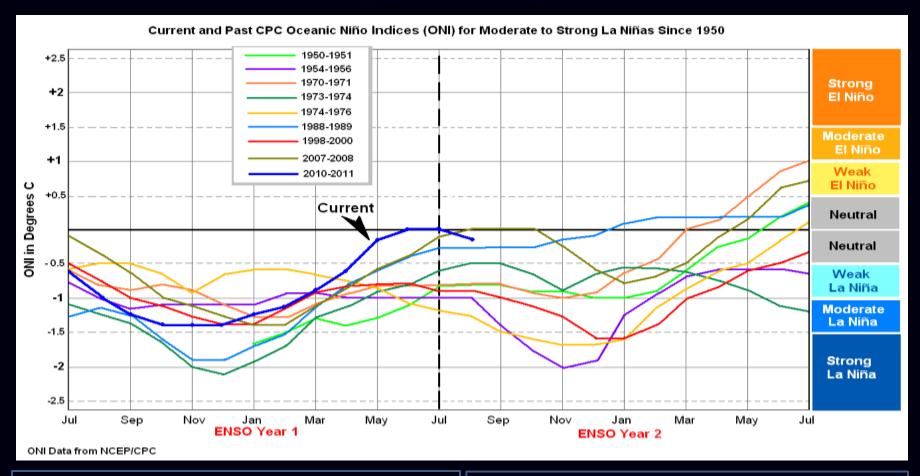
The ONI is based on sea surface temperature (SST) departures from average in the Niño 3.4 region of the eastern tropical Pacific and is a principal measure for monitoring, assessing and predicting ENSO.

ONI is defined as the threemonth running-mean SST departures in the Niño 3.4 region.

ONI is used to place current ENSO and non-ENSO events into a historical perspective.

NOAA's operational definitions of El Niño and La Niña are keyed to the ONI index.

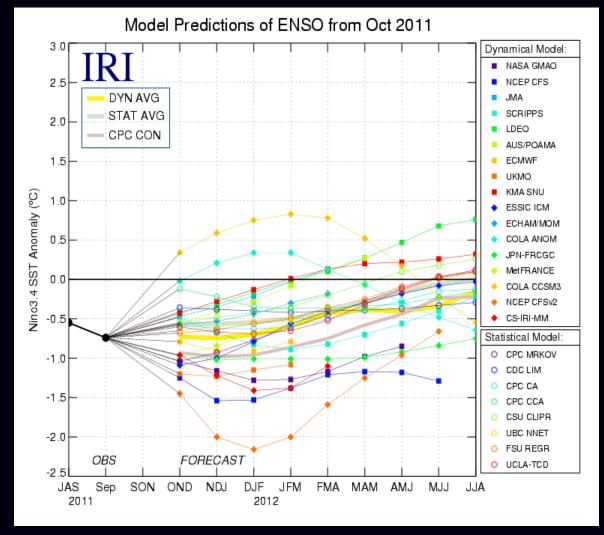
Latest ONI



Above is a comparison of the Oceanic Niño Indices (ONI) for eight moderate to strong La Niña events since 1950. Comparing the four moderate (ONI of -1.0 to -1.5) La Niñas to the moderate La Niña of 2010-2011 (thick blue line), notice that the 2010-2011 cold event peaked earlier in the autumn and ended sooner than most in the spring during its first (ENSO) year (July to June).

During the second ENSO year, moderate La Niñas of 1974-75 and 1998-99 grew to strong intensity by December, while the moderate La Niñas of 1970-71 and 2007-08 remained weak throughout the winter season when ENSOs normally peak. The performance of the current ONI resembles closest the ONI of 2007-2008 which warmed above -0.5 (ENSO-neutral) during the intervening summer and remained weak during the winter of ENSO year 2.

Model Predictions for El Niño/Southern Oscillation (ENSO) Through June-July-August of 2012

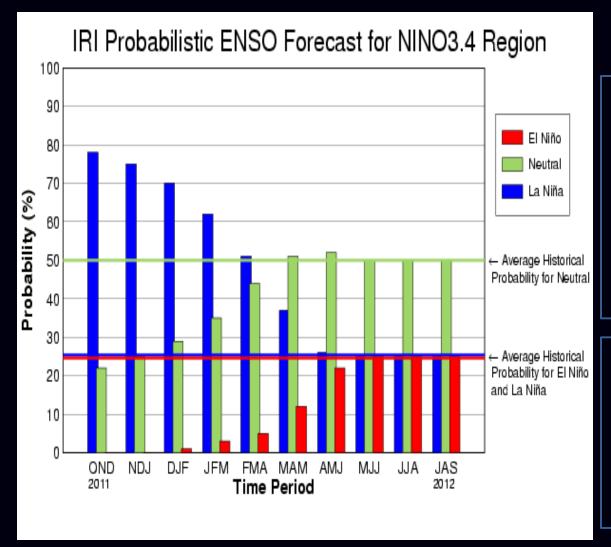


Source: International Research Institute for Climate and Society (IRI) – Issued 10/19/11

Since August of this year, weak La Niña conditions have persisted in the tropical Pacific Ocean.

Based on a majority of the dynamical and statistical ENSO models, weak to moderate La Niña conditions are predicted to persist through the 2011-2012 December-February season. Thereafter, ENSO-neutral conditions are expected to develop and persist through the spring of 2012.

Some models including NCEP's
Coupled System Forecast Model
(CFS) go so far as to predict
moderate to strong La Niña
conditions by this December.
Except for the COLA CCSM3 and
LDEO, none of these model predict
warm phase El Niño conditions
during the next 12 months.



Looking at the Numbers...

There is an approximately 78% probability that La Niña conditions will continue through the current October-December season and an approximately 75% chance that these conditions will exist during the December-January 2011-2012 season.

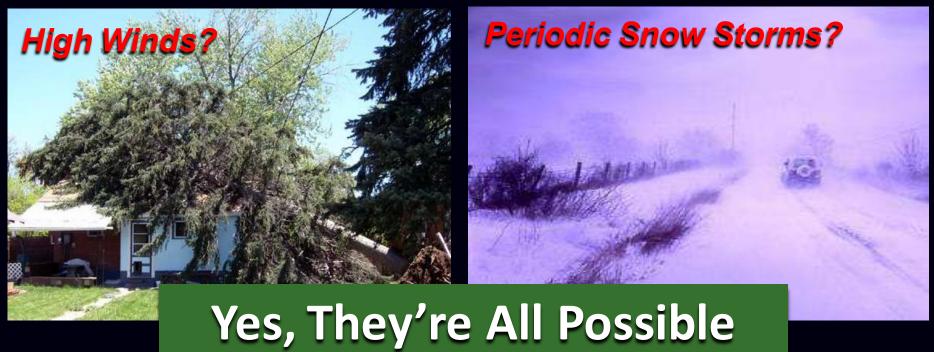
Furthermore, there is about a 44% probability that neutral conditions will exist during the February-April 2012 season, and very little chance that El Niño conditions will develop before next summer.

Source: International Research Institute for Climate and Society (IRI) — Updated 10/19/11

What Have We Covered Up to This Point:

- La Niña conditions returned to the Pacific Ocean in August after several weeks
 of ENSO-neutral conditions earlier in the summer.
- Sea surface temperature anomalies (SSTA) in the central and eastern equatorial Pacific have continued to cool and expand westward beyond the International Date Line with easterly trade winds.
- The latest weekly SSTA value for ENSO 3.4 is -0.8C; an indication that weak La Niña conditions exist in the Pacific.
- Subsurface temperature anomalies in the east-central Pacific have also continued to cool to lower depths (but at a slower rate in recent days); another indication that La Niña conditions continue to strengthen.
- Atmospheric circulations remain weak and deep convection (thunderstorm activity) remains largely suppressed over the central tropical Pacific Ocean.
- The latest predictions call for weak to perhaps moderate La Niña conditions through the November-January 2011-2012 climate season, then a transition to ENSO-neutral conditions later in the winter and during the spring of 2012.

So How Might La Niña and ENSO-Neutral Conditions Influence Weather Patterns Across Colorado this Winter?

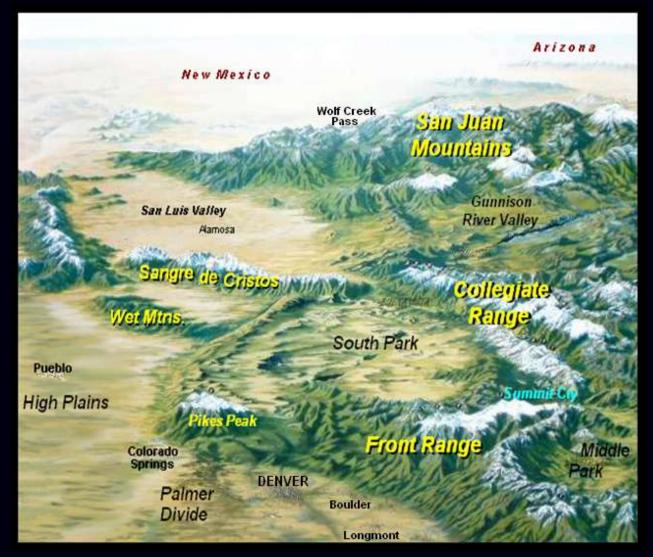








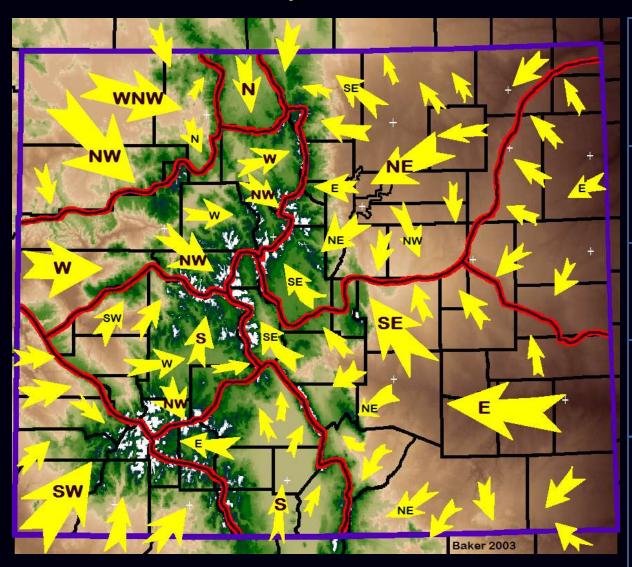
Understanding Colorado Weather



To better understand Colorado weather, one needs to understand the significant influence that topography (mountains, plateaus, valleys, plains, etc.) has on wind, temperature and precipitation patterns and even on the path of storms.

Looking Southwest from the High Plains of Northeast Colorado

Favorable Wind Components That Promote Precipitation Formation in Colorado



In northwest Colorado, the favorable upslope wind component is a northwesterly direction.

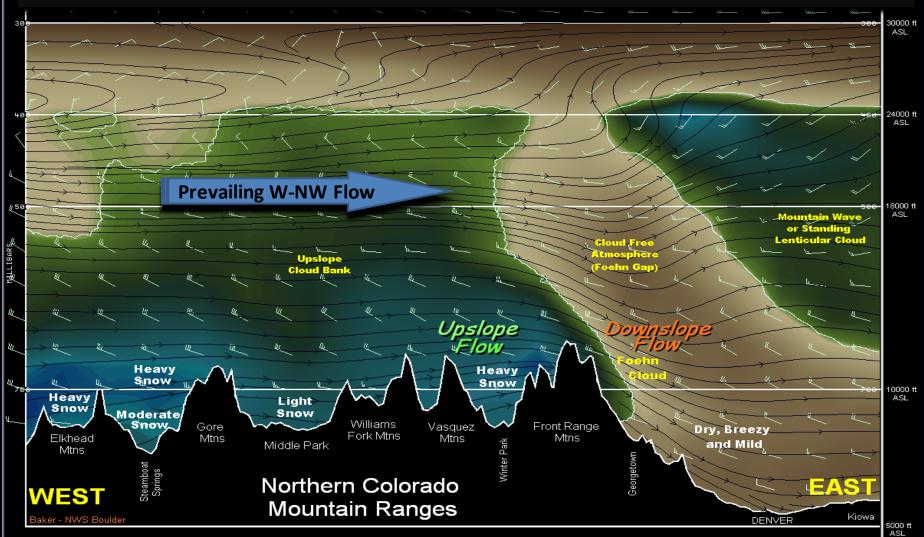
In west-central Colorado, it is principally a westerly component.

In southwest Colorado, it is principally a southwesterly component.

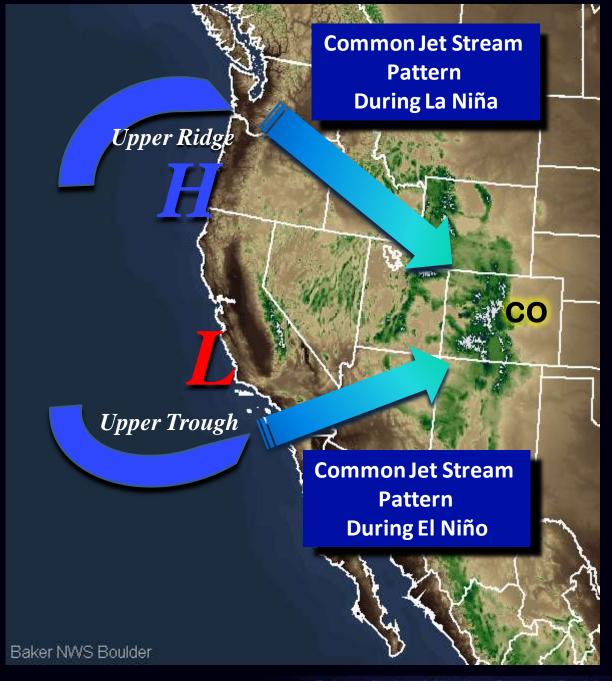
In northeast Colorado, it is principally an east-northeasterly direction.

And in southeast Colorado, the optimum upslope component is an east-southeasterly wind direction.

Wind Profile Often Observed Last Winter During the Moderate La Niña



Exposure to a wind laden with moisture can mean all the difference between receiving precipitation or not. An **upslope wind** would favor cloud and precipitation formation, while a **wind moving down** a **slope** tends to dry and warm and therefore reduces the chance for precipitation and even clouds.

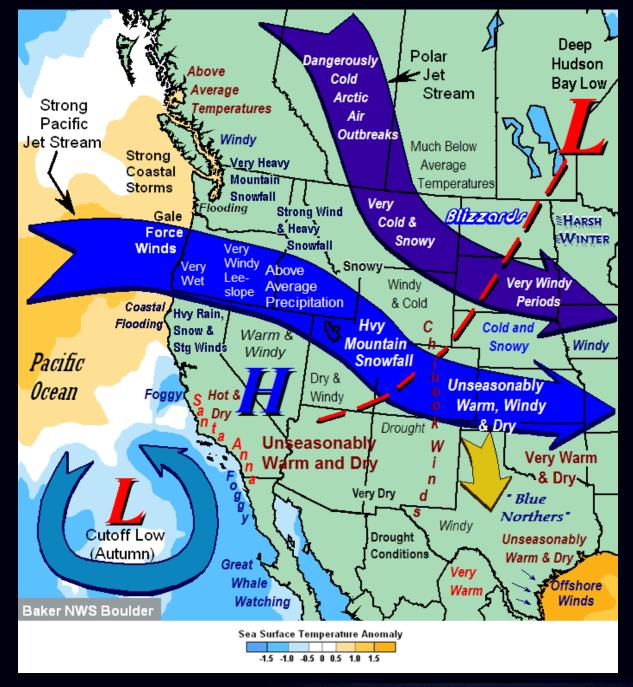


The Pacific jet stream, a meandering river of strong high altitude (18000 to 30000 feet ASL) winds over the mid-latitudes, plays an important role in the distribution and production of precipitation in Colorado, particularly during the winter

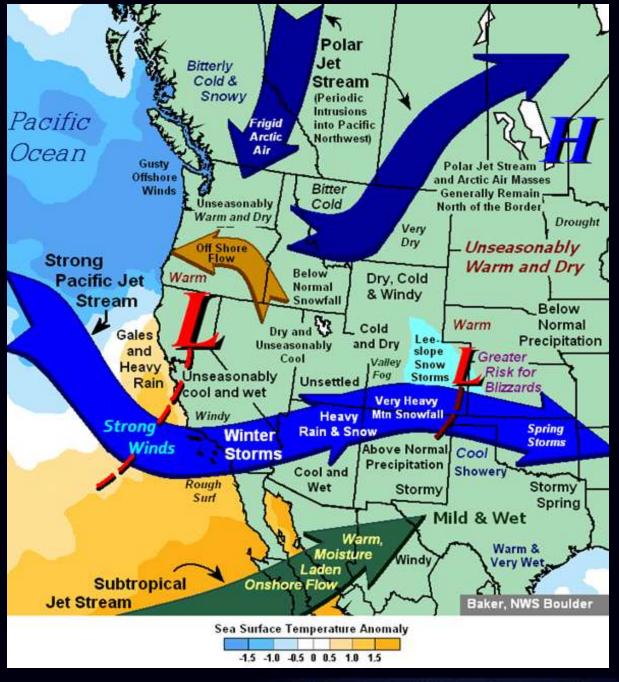
and spring seasons.

Under moderate to strong La Niña conditions, the Pacific jet stream will curve northward around the top of a large upper level high pressure ridge that typically remains nearly stationary for much of the winter and early spring along the west coast of the U.S.

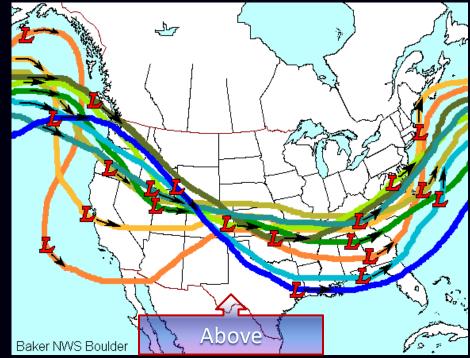
Under moderate to strong El Niño conditions, the Pacific jet stream will often be seen curving southward around the bottom of a deep upper level low pressure trough positioned along the west coast of the U.S.



Jet Stream
Patterns
and
Winter Weather
Conditions
Commonly Observed
During
Moderate to Strong
La Niñas



Jet Stream
Patterns
and
Winter Weather
Conditions
Commonly Observed
During
Moderate to Strong
El Niños

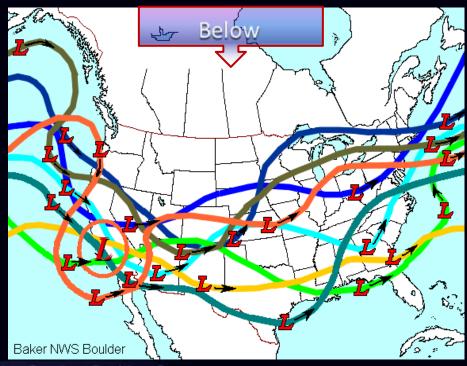


Typical Wintertime Storm Track Pattern During Moderate to Strong La Niñas

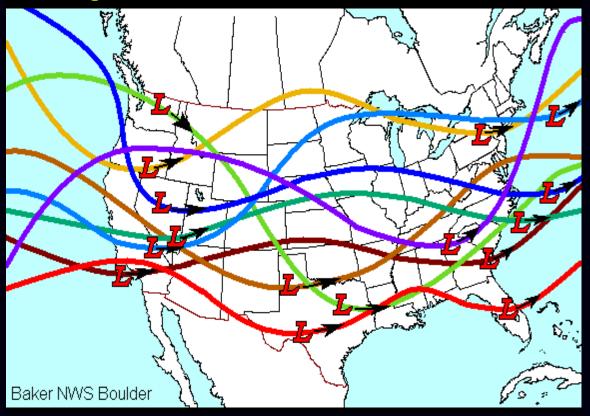
Most wintertime storm system affecting the western continental United States (CONUS) typically originate in the Pacific Northwest (Washington, Oregon) during moderate to strong La Niñas. These fast moving storms driven by a powerful Pacific jet stream are usually laden with moisture and are capable of producing strong, potentially damaging winds. The common track for these storms is southeastward across the northern Great Basin (Idaho, northern Utah) and central Rocky Mountains (Colorado). However, it is not unusual for a few storms to track farther south should the west coast high pressure ridge shift westward over the eastern Pacific.

Typical Wintertime Storm Track Pattern During Moderate to Strong El Niños

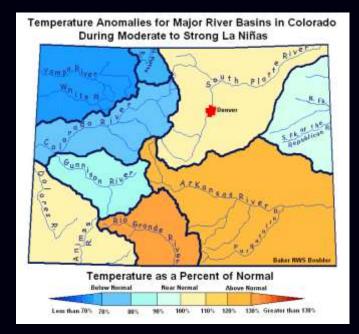
Under moderate to strong El Niño conditions, it is more common for wintertime storm systems to track farther south over southern California and the Desert Southwest. The forward progress of these storms tend to be somewhat slower, thereby increasing their potential to produce greater precipitation, particularly over the mountainous terrain of Arizona, southern Utah, southern Colorado and New Mexico. Southern and eastern Colorado will typically see greater than average precipitation (snowfall) during the winter and spring under moderate to strong El Niño conditions.



Winter Season Storm Track Pattern During ENSO-Neutral and Weak ENSO Conditions

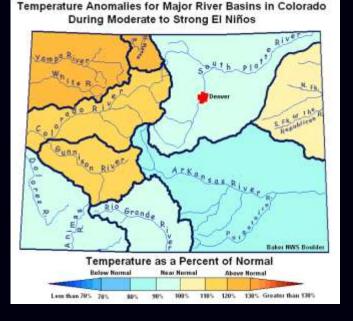


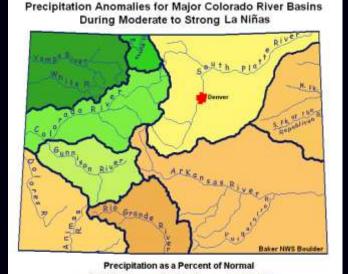
The winter season storm track pattern over the western U.S. under ENSO-neutral and weak ENSO conditions tends to be more random in coverage compared to the more consistent patterns associated with stronger ENSO events. This apparent randomness is due in large part to greater latitudinal oscillation of a weaker Polar jet stream, which in turn, results in fewer temperature and precipitation extremes for Colorado.



Temperature

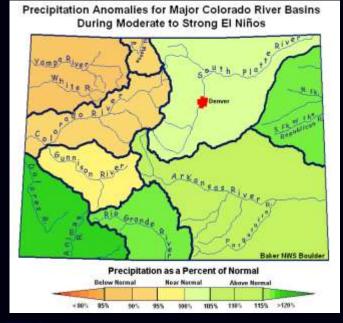
Winter season temperatures typically run colder than average across northwest Colorado and warmer than average across southern and eastern Colorado during moderate to strong La Niñas. Under El Niño conditions, the temperature anomaly pattern reverses with the northwest typically warmer than average and the south and east colder than average.

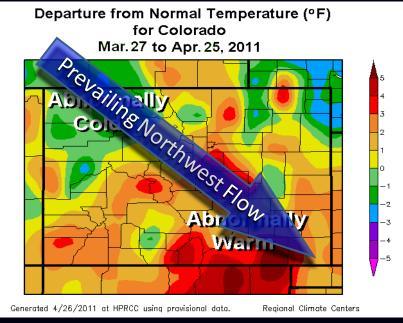


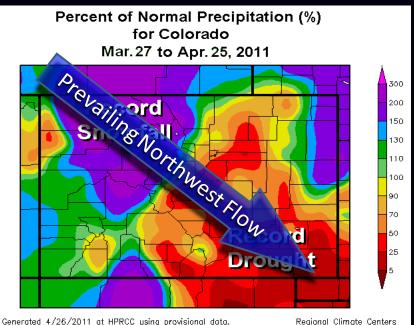


Precipitation

Winter season precipitation (snowfall) historically was greater than average across northwest Colorado and was less than average across the remainder of the state during moderate to strong La Ninas. During El Niños, the northwest tended to be drier than average and the south and east wetter (snowier) than average during the winter season.



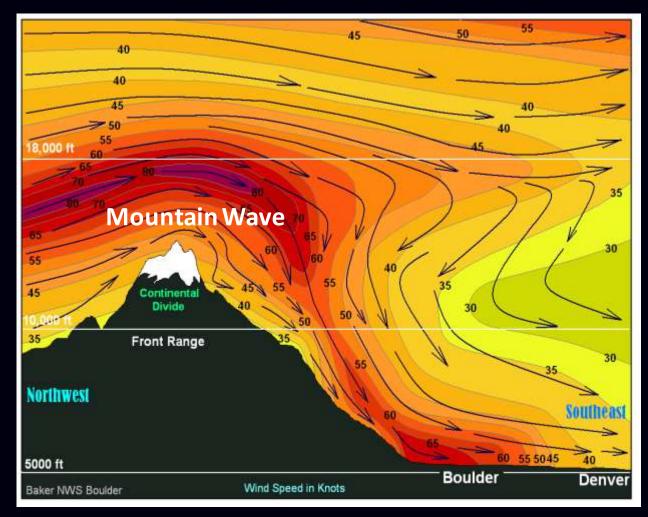




Last winter and spring during a moderate La Niña, Colorado experienced abnormally cold and snowy conditions across the northwest and west central portions of the state and abnormally warm and dry conditions across the south and east. All time record snow amounts were recorded in the northern mountains, while some of the worst drought conditions ever observed in Colorado plagued the southeast plains and San Luis Valley.

A strong and persistent northwesterly flow pattern associated with an abnormally strong Pacific jet stream is believed to be one important factor responsible for the extreme weather conditions observed across Colorado last winter and spring.

High Winds Along the Colorado Front Range

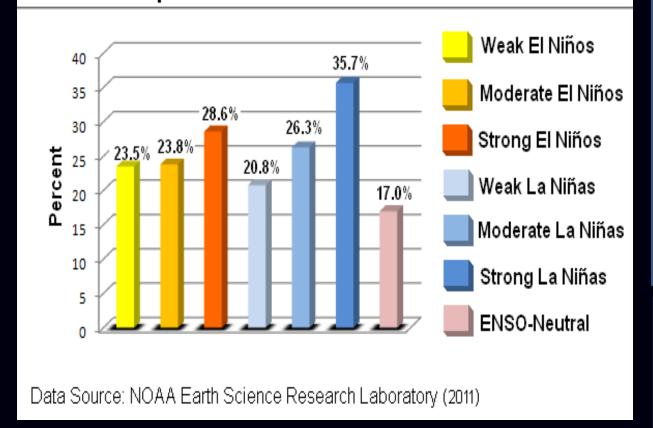


Cross Section Depicting A Breaking Mountain Wave and Wind Trajectory Profile Commonly Associated with High Wind Events Along the Colorado Front Range Front Range high wind events typically develop in the presence of a steeply sheared mountain wave breaking over the crest of the Front Range.

This pattern will often produce gusty and erratic downslope winds, referred to as Chinook winds, which have been clocked at speeds well over 100 mph.

Autumn and spring are typically the peak periods for these potentially damaging wind storms. However, it's not uncommon to experience these warming and drying downslope winds at any time of the year.

Frequency (as a Percent) of High Wind Days in the Boulder Area from 1969-2010 with Respect to ENSO and Non-ENSO Conditions



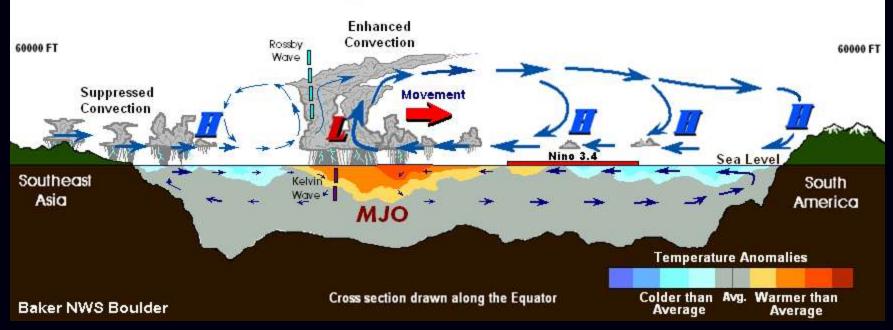
A high wind is defined as having a speed of at least 70 mph.

According to wind storm data provided by NOAA/ ESRL in Boulder from 1969 to 2010, the greatest number of high wind days in the Boulder area occurred during strong La Niña conditions (35.7% of the time), followed by strong El Niño conditions (28.6%) and moderate La Niña conditions (26.3% of the time).

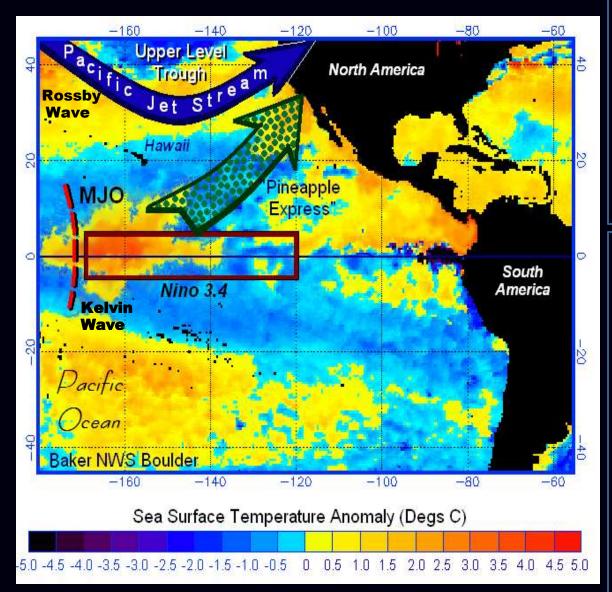
Weak La Niña and ENSOneutral conditions had the lowest number of high wind days at 20.8% and 17.0%, respectively.



Madden-Julian Oscillation (MJO) in the Tropical Pacific Ocean

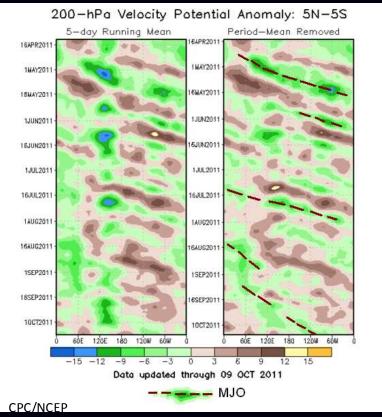


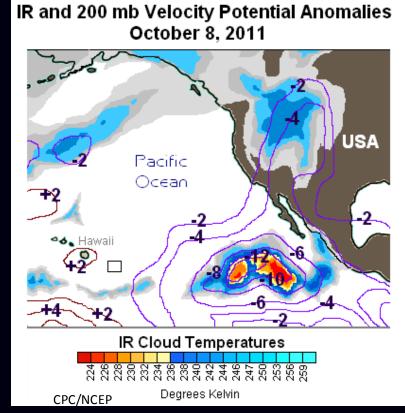
Interseasonal variations in wind and temperature produced by the 30-60 Day Tropical Wave, better known as the Madden-Julian Oscillation (MJO), can have a significant impact on global atmospheric and oceanic circulations. As its name implies, the time it takes for most MJOs to cross the Pacific Ocean varies from 30 to 60 days with the average around 45 days. Strong MJO activity is often observed during weak La Niña and ENSO-neutral years, while weak or absent MJO activity is typically associated with strong El Niño episodes. MJOs of moderate to strong intensity crossing the eastern equatorial Pacific can have a significant influence on weather patterns over the western and central United States. Predicting the start of an MJO is quite difficult and forecasting its eventual magnitude can be nearly as difficult.



An eastward propagating oceanic Kelvin wave (MJO) will often be coupled with an atmospheric Rossby wave over the mid-latitudes. Ocean waters warm in advance of the Kelvin wave by means of subduction and this warming initiates deep convection (i.e., thunderstorms) ahead of this wave.

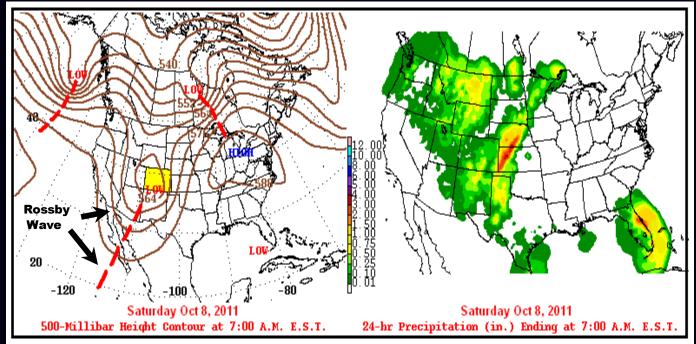
As the oceanic Kelvin wave moves across the Niño 3.4 region of the eastern Pacific, the accompanying Rossby wave will usually deepen as it propagates over the western U.S. Enhanced southwest flow (sometimes referred to it as the "Pineapple Express") produced by the wave amplification transports moisture laden subtropical air northward over the western and central U.S., occasionally resulting in a significant precipitation event for much of this region.

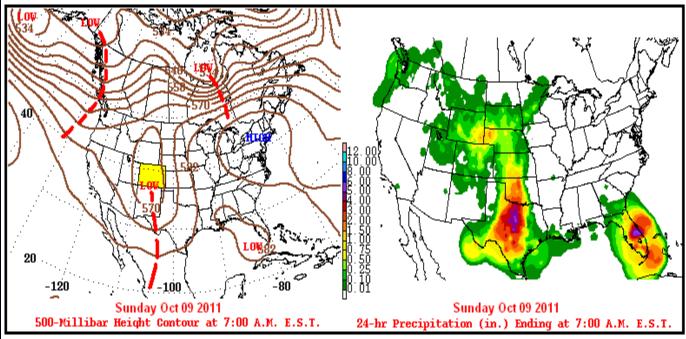




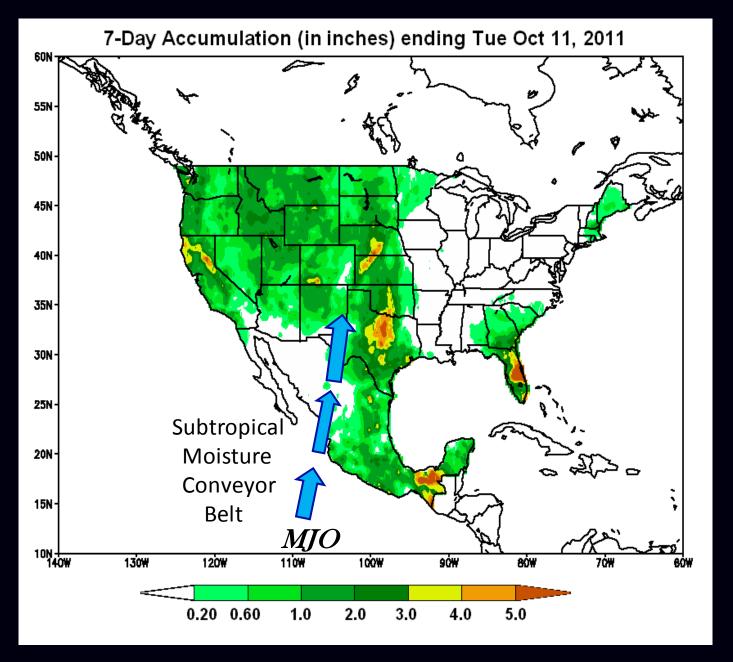
This was the case during the first half of October 2011. A Kelvin wave originating in the Indian Ocean during September of this year propagated eastward across the Pacific Ocean along the Equator, strengthening along the way. By the first week of October, the Kelvin wave moved past the International Date Line, and by the second week of October entered the Nino 3.4 region of the eastern Pacific accelerating along the way. The dashed RED line in the lower right corner of the upper left panel represents the position of the MJO-Kelvin wave with respect to time (along the left margin) and latitudinal location (along the bottom of the chart).

The upper right panel displays infrared (IR) satellite data and model derived 200 mb velocity potential anomalies over the eastern Pacific and North America on 08 October 2011. On that day, a broad swath of deep convection extended northward over the western U.S. from a hurricane and newly formed tropical storm off the west coast of Central America. The cluster of negative velocity potential anomalies (an indicator of divergence aloft associated with deep convection) is in the vicinity of the MJO-Kelvin wave.





As the MJO-Kelvin wave propagated eastward through NINO 3.4 region, a Rossby wave (left panels) moved over the western U.S. A broad shield of precipitation (shading in the right two panels) covered the western U.S. on the 7th and 8th of October and across the central and southern Great Plains on the 9th and 10th.

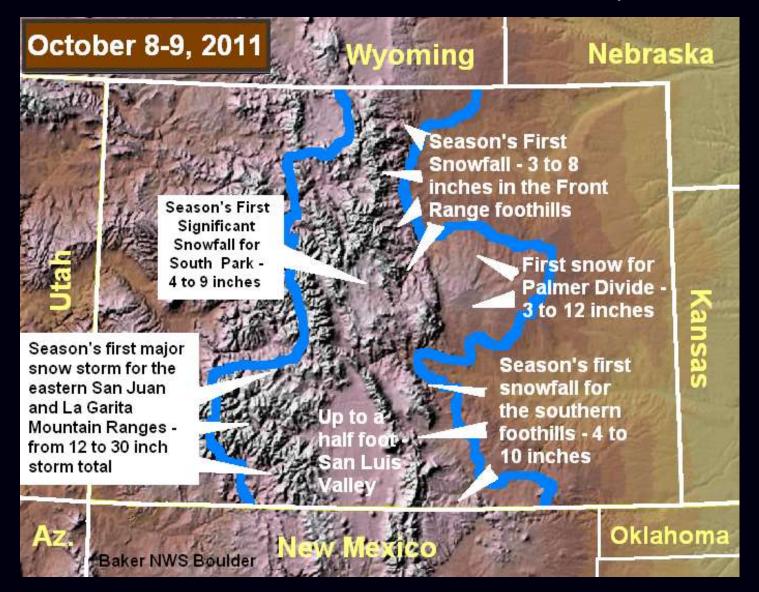


MJO Eases Record Breaking Dry Spell

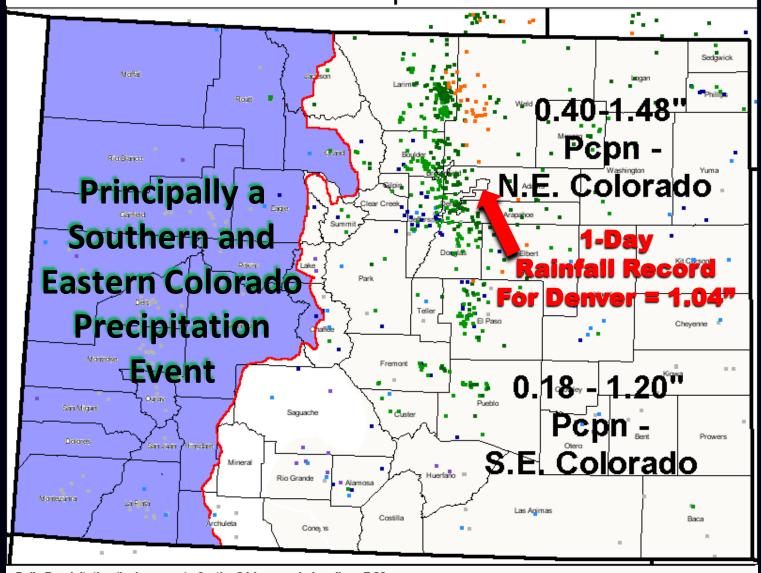
Many parts of the central and southern Great Plains enjoyed their first rainfall in over six months during the second week in October 2011, compliments of a moderate to strong MJO.

Parts of Texas received over a half foot of rain which caused serious flash flooding.

Here in Colorado... 24-Hour Snow Totals as of 8 AM MDT Oct 9, 2011



24-Hr CoCoRahs Precipitation for Colorado



Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

Colorado 10/9/2011

Output

Colorado 10/9/2011

Output

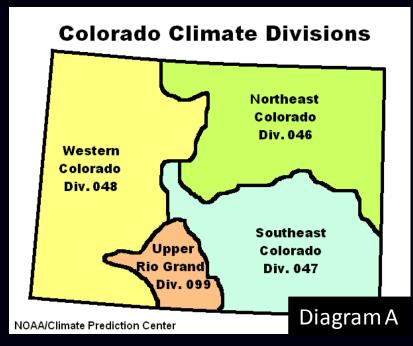
Colorado 10/9/2011

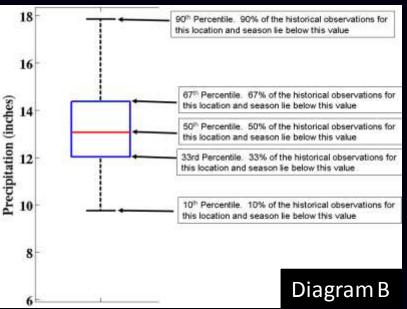
Output

Colorado 10/9/2011

Historical Trends in Temperature and Precipitation For Colorado for La Niña, **ENSO Neutral and El Niño Conditions**

CPC Whisker Plots





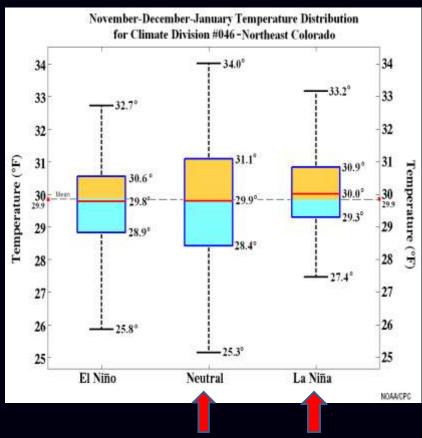
<u>Diagram A</u>: Colorado is sub-divided into four climate divisions. Climate divisions 046, 047 and 099 are located east of the Continental Divide, and division 048 west of the Divide.

NOAA's Climate Prediction Center (CPC) has produced historical distributions of 3-month temperature and precipitation associated with three different ENSO categories – El Niño, La Niña and neutral (non-ENSO) events – for each climate division.

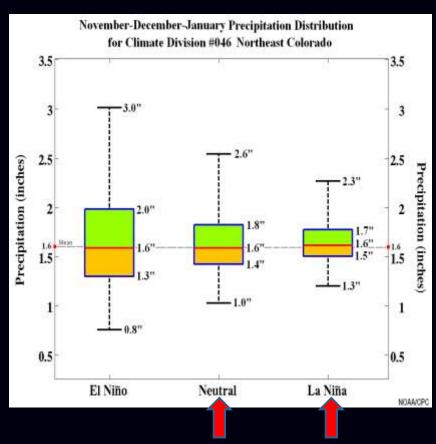
<u>Diagram B</u>: These historical temperature and precipitation distributions can be viewed using an ENSO box and whisker analysis plot (explanation to the left).

The red line inside the ENSO box represents the mean or 50th percentile of the data (temperature or precipitation) distribution. Approximately 34% of the total observations exist within the ENSO box, and the remaining observations (or 66%) outside of the box.

ENSO Box and Whisker Analysis Plots for the Northeast Colorado Climate Division #046 for the 3-Month Season November-January

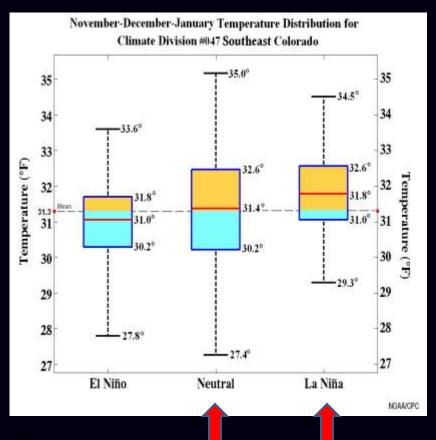


Historically, temperatures for northeast Colorado climate division 046 during November-December-January were near average under El Niño, ENSO-neutral and La Niña conditions.

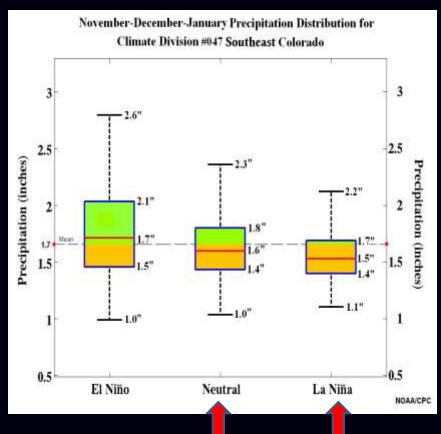


Past precipitation for northeast Colorado during this three month period also tended to be near average during El Niño, ENSO-neutral and La Niña conditions.

ENSO Box and Whisker Analysis Plots for the Southeast Colorado Climate Division #047 for the 3-Month Season of November-January

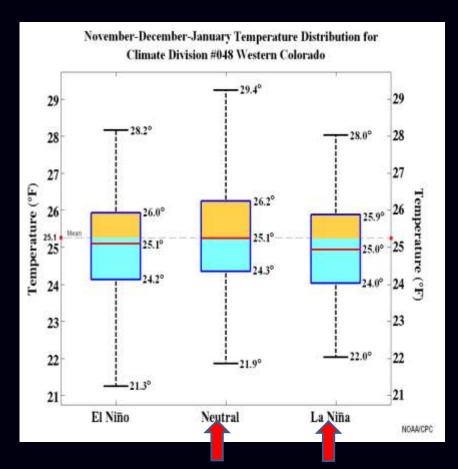


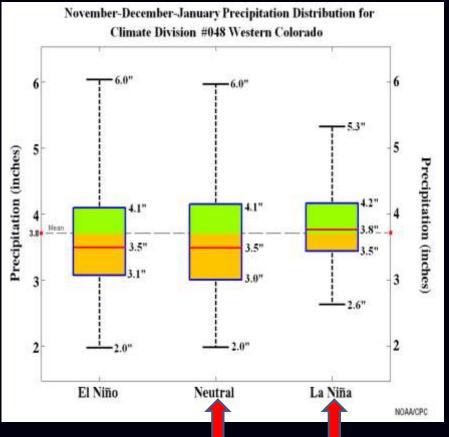
For southeast Colorado climate division 047, temperatures for November-December-January were near average during El Niño and ENSO-neutral conditions and slightly above average during La Niña conditions.



Precipitation for the same three month period was near average during El Niño and ENSO-neutral conditions and slightly below average under La Niña conditions.

ENSO Box and Whisker Analysis Plots for the Western Colorado Climate Division #048 for the 3-Month Season of November-January





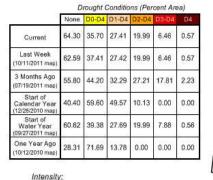
Temperatures for the western Colorado climate division 048 during November-December-January have historically been near average during El Niño and ENSO-neutral conditions and slightly below average during La Niña conditions.

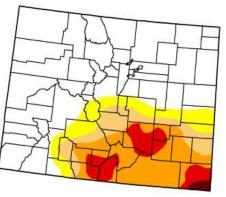
Finally, precipitation during the same three month period was slightly below average during El Niño and ENSO-neutral conditions and near average during La Niña conditions.

U.S. Drought Monitor

October 18, 2011

Colorado





The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

D3 Drought - Extreme

D4 Drought - Exceptional

http://droughtmonitor.unl.edu

D0 Abnormally Dry

D2 Drought - Severe

D1 Drought - Moderate







Released Thursday, October 20, 2011 David Miskus, NOAA/NWS/NCEP/CPC

Current Drought Conditions In Colorado

Drought conditions have continued to ease across southern and eastern Colorado because of recent precipitation, slightly cooler temperatures and lower evapotranspiration rates due, in part, to less wind. However, extreme to exceptional drought conditions persist in portions of southeast and south central Colorado.

Drought Outlook for Colorado

As of mid-October, the drought outlook prepared by the National Drought Mitigation Center calls for no change in the drought conditions across south central and southeast Colorado through next January. However, drought conditions are no longer expected to develop in southwest Colorado.



U.S. Seasonal Drought Outlook



Drought Tendency During the Valid Period Valid October 20, 2011 - January 31, 2012 Released October 20, 2011

KEY:

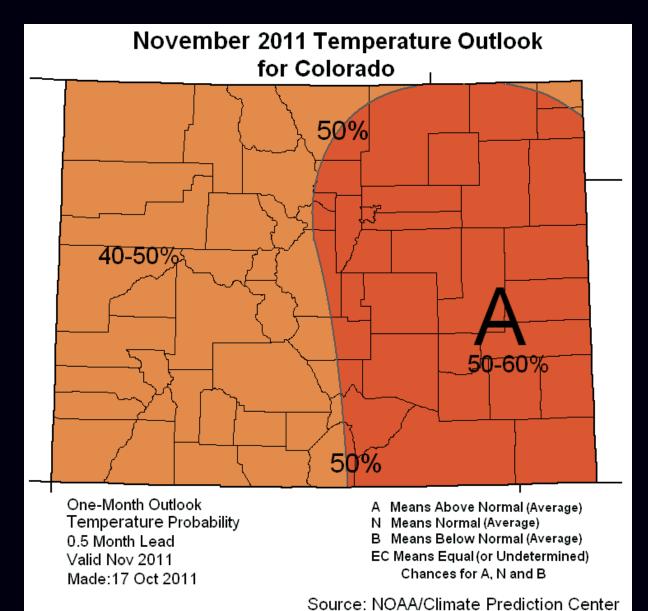
- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve. impacts ease
- Drought development likely



Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events - such as individual storms - cannot be accurately forecast more than a few days in advance. Use caution for applications - such as crops - that can be affected by such events "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity) For weekly drought updates, see the latest U.S. Drought Monitor, NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels. but do not necessarily imply drought elimination.

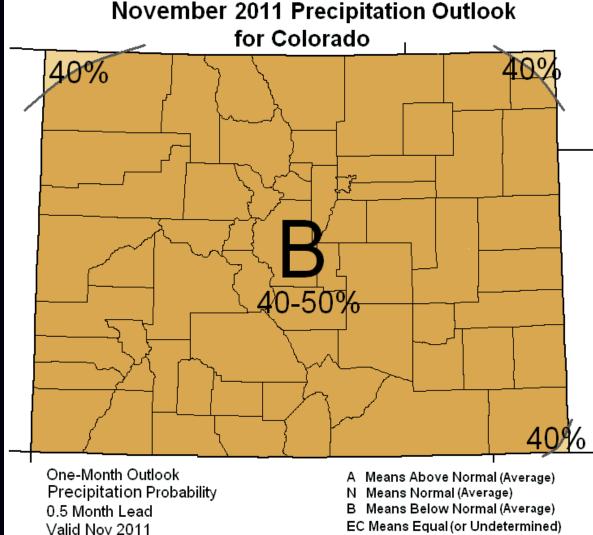
Source: National Drought Mitigation Center

November-January 2011-2012
Temperature and Precipitation
Outlooks for Colorado
Issued by NOAA's
Climate Prediction Center



November 2011 Temperature Outlook for Colorado

The latest outlook from NOAA's Climate Prediction Center calls for a 50 to 60 percent chance for above average temperature across nearly all of eastern Colorado and a slightly lower chance (40 to 50 percent chance) for the remainder of the state during the month of November.



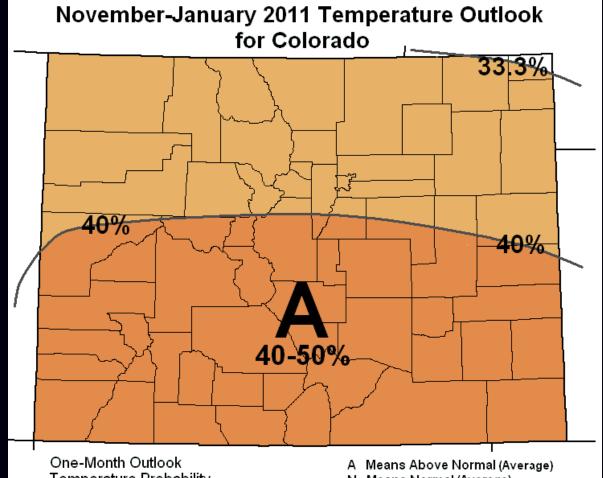
November 2011 Precipitation Outlook for Colorado

The latest outlook from CPC calls for a 40 to 50 percent chance for below average precipitation across nearly the entire state of Colorado during the month of November.

Made: 17 Oct 2011

Chances for A, N and B

Source: NOAA/Climate Prediction Center



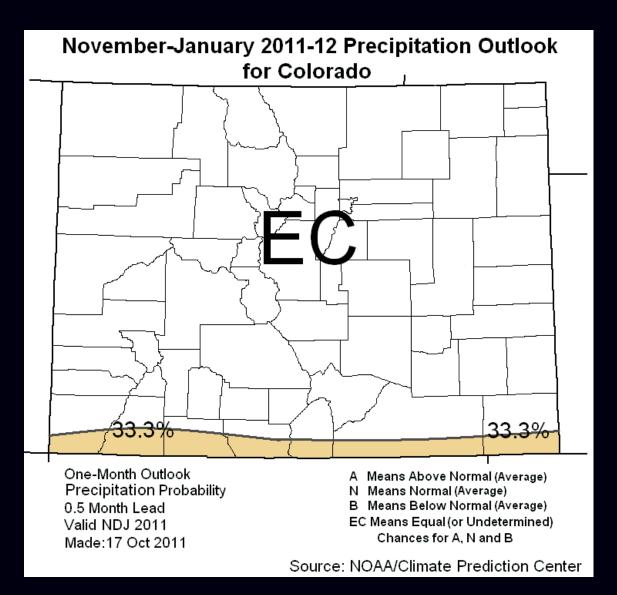
One-Month Outlook Temperature Probability 0.5 Month Lead Valid NDJ 2011 Made:17 Oct 2011

- N Means Normal (Average)
- B Means Below Normal (Average)
- EC Means Equal (or Undetermined) Chances for A, N and B

Source: NOAA/Climate Prediction Center

NDJ 2011 Temperature Outlook for Colorado

The outlook for November-December-January calls for a 40-50% chance of above average temperatures across the southern half of Colorado and a 33.3-40% chance across the northern half of the state.



NDJ 2011 Precipitation Outlook for Colorado

Finally, there is a 33.3 to 40% chance for below average precipitation along the southern border of Colorado during the period November-December-January.

For the remainder of the state, the precipitation outlook is less certain, as indicated by the EC symbol used by CPC.

To Sum It Up...

- After the moderate to strong La Niña of last winter and ENSO-neutral conditions this past summer, La Niña conditions have returned for this fall and winter.
- Climate models predict a weak to moderate La Niña through the November-December-January 2011 climate season, then ENSO-neutral conditions during the latter half of winter and spring of 2012.
- Historically, weak La Niña events have had little influence on winter season weather patterns in Colorado. However should this La Niña strengthen and become moderate in strength, Colorado could possibly see a repeat of the abnormal temperature and precipitation pattern observed last winter, at least during the first half of the winter. During the second half of the winter and spring, there is more uncertainty in the outlook.
- Interseasonal variations in temperature and precipitation caused by oceanic and atmospheric circulations such as the Madden-Julian Oscillation (MJO) could have a greater impact on Colorado weather patterns this winter. Strong MJO activity is more common during ENSO-neutral and weak La Niña years.
- **Therefore, c**ould we see a repeat of the extreme weather that significantly impacted Colorado last winter? Yes, it is possible *but less likely*, even with the return of La Niña this fall.